Market Power and Competition in Audit Markets

Abstract

This study investigates the impact of audit firms' market power on audit fees in MSA-Industry audit markets. We propose that the state of competition in each MSA-Industry market reflects two components. The first component is the audit firms' collective market power over their clients, and the second is the audit firms' relative competitive positions with respect to each other. We argue that the measured concentration of the market is positively associated with the audit firms' collective market power over their clients, and tends to increase audit fees for all engagements. In addition, the fees charged by a specific audit firm are a function of its relative competition position in the market. We document that audit fees increase in market concentration and decrease in the audit firm's relative size as compared to the largest audit firm in the market. Given the fact that an inconsistent relationship between audit fees and market concentration is often documented in the extant literature, this paper advances our understanding of the impact of audit market concentration on competition in audit markets from both theoretical and empirical perspectives.

Market Power and Competition in Audit Markets

1. Introduction

After several rounds of consolidation among the largest public accounting firms since 1980s, audit markets have clearly become more concentrated in the U.S. and elsewhere (Ferguson, Pinnuck, and Skinner, 2014), and concentration has further increased after the demise of Arthur Andersen in 2002. The competitive performance of the remaining Big 4 firms is clearly a concern to regulators (GAO, 2008). One of the concerns is whether market concentration leads to higher audit fees. Given the limited number of studies and mixed findings, DeFond and Zhang (2014) suggest that additional research is needed in this area. Responding to this call for research, in this paper we have three objectives relating to the impact of audit market concentration on audit fees. First, we seek to advance understanding of competition in MSA-Industry audit markets from a theoretical perspective. Second, we develop a more complete empirical method to measure the state of competition. Third, we provide an explanation for the puzzling empirical relations between market concentration and audit fees documented in the literature.

Competition is a dynamic process that is difficult (or impossible) for regulators or researchers to observe directly. As a result, the nature of competition in a market has typically been examined empirically using the *structure* → *conduct* → *performance* paradigm of industrial organization. The observable *structure* of an industry is normally measured by the degree of supplier concentration. *Conduct*, on the other hand, is not observed but is inferred from *performance*, using measures such as prices, gross margins, or profitability. The empirical correlation between variations in structure and measures of performance across markets is then used to make inferences about the degree of competition in an industry, with higher supplier

concentration commonly found to be associated with poorer industry performance (e.g., higher average prices).[1]

The Herfindahl-Hirschman Index (hereafter HHI) is often used as a measure of concentration and potential market power of firms in a market (e.g., Pearson and Trompeter, 1994). HHI is defined as the sum of the squares of the market shares of the firms within the market. The value of the index ranges from 0 to 1. A low value suggests many similar size firms in the market while a high value suggests that a few large firms dominate a market. High HHI value is regarded as an indication there may be a low level of competition in a market (Weiss, 1989) and consequently high prices for the products/services sold in the market. The HHI has also been used to measure market power and the intensity of competition among audit firms. Therefore, we expect audit fees in a market to be positively associated with HHI for the market.

However, auditing services are not completely the same as consumer products. Audit production is highly client-specific and the characteristics of audit firms (e.g., Big vs. Non-Big) affect audit quality and audit fees. The market for audit services has particular characteristics, such as the service is normally purchased in its entirety from a single audit firm, the purchase is annual, and the costs of supplier switching are not trivial. Chu et al. (2018, hereafter, CSYZ) finds that audit fees are a decreasing function of the size difference between the largest audit firm in the market and the incumbent audit firm. Therefore, in addition to market concentration, the audit firms' relative competitive positions in the market also play an important role in determining audit fees. We propose that competition in an audit market reflects two components: the audit firms'

[1] We recognize that the structure → conduct → performance paradigm is controversial in the industrial organization literature (see Dopuch and Simunic 1980 for a discussion of this issue in an auditing context). However, concentration in the auditing industry is clearly of concern to regulators and may well proxy for conditions that allow large audit firms to exercise market power. Ultimately, the impact (if any) of concentration on industry performance is an empirical issue.

collective bargaining power over their clients and the audit firms' relative competitive positions with respect to each other in the market. The first component increases the fees charged by all audit firms, while the second component distinguishes the fees charged by individual audit firms. In other words, we suggest that an audit fee model should include determinants for both audit firms' collective market power and the audit firms' differential competitive positions within the market i.e., within market competition.

When the market is more concentrated, while all auditing firms in the market may extract more rents and charge higher fees because of their market power, the largest auditor also has a competitive advantage over small firms and can charge even higher fees. Hence, we predict that the largest firm charges relatively higher fees than other firms when the market is more concentrated. To put it another way, without including a separate determinant for an audit firms' relative competitive positions in the audit fees model, HHI would load the effects of both audit firms' collective bargaining power over auditees and individual firms' relative competitive positions. This is because these two forces are correlated, which could result in differential estimated effects of HHI on audit fees charged by large and small audit firms.

For the smaller firms, the relationship between the market concentration and their audit fees is affected by their relative size in the market. More specifically, if a market with high concentration only contains a few similar sized large audit firms, then the audit fees charged by every audit firm in the market will be high due to the high concentration, and no audit firm has to lower its fees significantly relative to the largest auditor, because there is no significant competitive disadvantage. In this case, the overall relationship between market concentration and average audit fees for the market is positive. However, if a market of high concentration reflects a very large audit firm and several much smaller firms, the smaller audit firms have to significantly lower their

fees relative to the largest auditor due to their significant competitive disadvantage. Since the small firm's disadvantage in a market is inherently an increasing function of the market concentration, if a sample used to test the relationship between market concentration and audit fees mostly consists of audit markets with significant number of small audit firms, then the estimated average effect of concentration on audit fees is likely negative. Hence, we predict that the presence of more small audit firms has a negative incremental effect on the relation between HHI and audit fees.

We test these predictions using U.S. public company audit fee data from 2000-2016. We consider competition in MSA-Industry markets that are defined by U.S. Metropolitan Statistical Areas (MSA, U.S. Census Bureau definition) and client 2-digit Standard Industrial Classification (SIC) industry, since audit market competition occurs mostly in MSA-Industry local markets (CSYZ).

We first find that audit fees are higher when the markets are more concentrated if the within market competition is properly controlled. Next, we document that HHI is positively correlated with larger firms' competitive positions and negatively correlated with smaller firms' competitive positions when the within market competition is not included. In other words, HHI has differential impacts on the audit fees charged by large and small audit firms. This is because audit firms' collective bargaining power over auditees and individual firms' relative competitive positions are correlated. HHI would load both effects and have a differential effect on audit fees charged by large and small audit firms if within market competition is not controlled separately. We demonstrate that once the within market competition is properly controlled, the coefficient of HHI becomes significantly positive and the differential impact becomes insignificant, because the differential impact is captured by the within market competition.

Furthermore, we show that highly concentrated markets are associated with lower fees if these markets have mostly clients of small audit firms. This is consistent with our conjecture that the positive effect of HHI is confounded by the within market competition (i.e., negative effect on fees) by loading the average effects of the concentrations on the fees charged by all firms. When the number of observations associated with small audit firms is correlated with the HHI value of the markets in the sample, then the average effect of HHI is negative. Overall, these results confirm our proposition that competition in an audit market is determined both by the audit firms' collective market power and individual audit firm's relative competitive positions.

This paper advances our understanding of the impact of audit market competition on audit fees. In particular, we provide a more complete picture for measuring the state of competition in an MSA-Industry market. Our study suggests that the base line audit fees in a market are the fees charged by the largest audit firm, which is an increasing function of the market concentration. All other audit firms will charge fees relative to the base line audit fees, according to their within-market competitive positions. Our theoretical arguments and empirical results provide an explanation for the puzzling inconsistent relationship between audit fees and market concentration documented in the literature (e.g., Pearson and Trompeter, 1994; Bandyopadhyay and Kao, 2004; Numan and Willekens, 2012). We believe our paper enhances understanding of the impact of audit market concentration on competition in audit markets and the role of HHI in measuring audit market competition, that is, HHI in a local market indeed increases audit fees in the market, *ceteris paribus*. In sum, this paper provides both a theoretical improvement (i.e., proposes audit market competition reflects market power and within market competition) and an empirical improvement (i.e., explains the relation between HHI and audit fees) to the existing literature on audit market competition.

The remainder of the paper is organized as follows. Section 2 reviews related literature and develops our hypotheses. Section 3 lays out the empirical test design, including definitions of key variables. Data are described and results of the hypothesis tests as well as various additional (sensitivity) tests are reported in Section 4. Section 5 concludes the paper.

2. Hypotheses Development

Prior literature

Several prior studies have examined the relation between audit fees and audit market concentration measured by HHI (e.g., Pearson and Trompeter, 1994; Willekens and Achmadi, 2003; Bandyopadhyay and Kao, 2004). The HHI is expected to be positively associated with audit fees, because a higher HHI may indicate a low level of competition and high market power (Weiss, 1989). Market power is regarded as the ability of a firm to raise the market price of a good or service to gain more profit. In a market of high concentration, few suppliers have significant pricing power and could collude (explicitly or tacitly) to increase prices in the market. Contrary to this prediction, existing research papers in general find that a high concentration index is associated with a decrease rather than an increase in audit fees. For example, Pearson and Trompeter (1994) find that higher industry concentration *negatively* affects audit fees, and Bandyopadhyay and Kao (2004) do not find that average audit fees are higher in more concentrated markets. On the other hand, Feldman (2006) documents that audit fees have increased in market concentration after the demise of Arthur Andersen. Feldman (2006) does not use HHI but the demise of Arthur Andersen as a measure for market concentration. In a recent study, Eshleman and Lawson (2017) find that the audit fees are negatively associated with HHI when the fixed effects of MSA are not controlled. After the MSA fixed effects are controlled for, they find that the relationship is switched to positive.

However, they do not provide an explanation for the switch of the sign of HHI other than claiming that controlling the MSA fixed effects is important. Therefore, a fundamental question remains to be answered: if the market concentration increases average prices, why do the audit fee models yield results often opposite to expectations? In this study, we provide an answer to the question from both theoretical and empirical perspective. Furthermore, we also provide an explanation for the empirical (inconsistent) results on the relationship between the audit fees and HHI in the literature.

Hypotheses

Audit production is very much client-specific and the characteristics of the audit service and audit fees are known to vary greatly with the size, complexity, and cash-flow risk of clients (Simunic, 1980). In addition, characteristics of the audit firm (e.g. is it a Big 4 or non-Big 4 firm) is likely to affect the audit service and audit fees. As a result, the audit fees in a market may not be uniformly determined and may be a function of audit firms' competitive positions within the market. Numan and Willekens (2012, hereafter "NW") suggest a method to distinguish auditors' differential competitive power within the market. They argue that the competition in an audit market cannot be captured by a constant for the market, such as HHI, and they find a negative relation between HHI and audit fees. We extend and modify the NW argument by proposing that HHI can measure the audit firms' collective market power but cannot distinguish the relative competitive positions of individual audit firms in the market. We argue that the overall audit firms' market power can affect fees distinctively, in addition to the effects of individual audit firms' relative competitive positions within a market.

When market concentration increases, fewer audit firms exert greater influence in the market which can lead to a higher probability of coordination in supplier pricing. To maintain a

higher price, coordination among the suppliers is essential. Economic theory (*structure → conduct → performance* paradigm of industrial organization) suggests that market concentration increases the market power of the suppliers and the prices of products and that the likelihood of exercising market power increases with market concentration. Therefore, our first hypothesis is:

Hypothesis 1: The fees charged by all audit firms are an increasing function of HHI for the market.

However, *structure* may not imply a specific *conduct*, in which case market concentration may not be associated with higher prices. Thus, whether audit market concentration is positively associated with audit fees is an empirical question.

As noted earlier, the existing literature has mainly documented that the HHI has a negative impact on audit fees, which is contrary to our prediction in Hypothesis 1. By definition, HHI measures the dominance of large firms over small firms, which implies that the value of HHI is positively associated with the values of small firms' competitive disadvantage. That is, high HHI value suggests that the large firms in a market are larger in size and fewer in number and low HHI value indicates there are more similar sized firms in a market. HHI and individual firm's competitive position relative to the largest firm in the market are likely positively correlated. Consequently, a higher value of HHI is associated with higher audit fees charged by large firms along with lower audit fees charged by small firms. The estimated effects of HHI on the large audit firms and small audit firms are different because the effects to certain extent reflect the effects of omitted within market competition. In other words, when the market is more concentrated, the largest firm in the market can extract more rents and charge higher fees, compared to all other firms. Hence, we predict that, if the within market competition is not captured with a separate

determinant, the impact of market concentration on audit fees is higher for the largest firm than for the smaller firms in a market. We state H2 in the following unconditional form to demonstrate the existence of both market power and within market competition in audit markets.

Hypothesis 2: The estimated effect of HHI on the fees charged by the largest audit firms is higher than that charged by other audit firms in the market.

HHI is a constant for the whole market. If the within market relative competition position is not controlled for and if the fee model does not include the interactive variables that distinguish the HHI effects on audit fees charged by individual firms, the estimated overall effect of HHI is the average impact of HHI on the fees charged by all firms. Depending on the compositions of the audit firms in the markets, the coefficient of HHI could be positive, negative, or insignificant. As Hypothesis 2 suggests, HHI increases large audit firms' fees and decreases small audit firms' fees in a market, the net effect of HHI as a whole is the average of the effects on all observations in the market. For a market with a given value of HHI, when the audit firms' relative competitive positions are not controlled, the confounding effect of this omission on the estimated HHI effect is a function of the significance of small audit firms in a market. When more observations are associated with the small audit firms or the sizes of small auditors are reduced, the estimated effect of HHI will be more confounded by the effects of lower fees charged by the small audit firms. Consequently, the average impact of HHI is reduced as the significance of small audit firms increases. We use the term "significance of small audit firms in a market" to indicate that the number of observations associated with small audit firms is more than the number of observations associated with the largest audit firm in the market or the contrast between the sizes of small and

large audit firms is significant. Therefore, if all markets in the sample suggest that the correlation between HHI and significance of small audit firms is positive, the estimated effect of HHI is then likely negative since higher HHI is associated with market of more observations of small audit firms. Otherwise, the average impact of HHI is positive.

To illustrate, assume there are two markets in the sample. In the first market, there are 10 auditees. The largest auditee is huge (accounts 80%) of the market and the other nine auditees account 20% of the market. Furthermore, the nine auditees are audited by four small audit firms with similar share and the largest audit firm only audits the largest auditee. In this market, the value of HHI is high. HHI will load the negative effects of competitive disadvantage on the fees of the nine observations associated with the small auditors and the positive effect of HHI on the one observation associated with the largest audit firm. In the second market, we also assume there are 10 auditees. In this case, all auditees are the same size. The largest audit firm audits six of them (accounts 60% of the market) and the other four auditees are audited by two small audit firms with similar share respectively. In this market, the value of HHI is lower than that in the first market. HHI will load the negative effects of competitive disadvantage on the fees of the four observations associated with the small auditors and the positive effect of HHI on six observations associated with the largest audit firm. The estimated effect of HHI using these two markets in the sample is the net effect of HHI on each market on audit fees, which is most likely negative since the first market has higher HHI, but lower average audit fees than the second market.

For completeness, we structure an opposite case using two markets. In the first market, there are 10 auditees. The largest auditee is large (accounts for 50% of the market) and the other nine auditees account 50% of the market. Furthermore, the nine auditees are audited by two small audit firms with similar share and the largest audit firm audits the largest auditee. In this market,

the value of HHI is moderate. HHI will load the negative effects of competitive disadvantage on the fees of the nine observations associated with the small audit firms and the positive effect of HHI on the one observations associated with the largest audit firm. In the second market, we also assume there are 10 auditees. In this market, all auditees are the same size. The largest audit firm audits eight of them (accounts 80%) of the market and the other two auditees are audited by two small audit firms respectively. In this market, the value of HHI is higher than that in the first market. HHI will load the negative effects of competitive disadvantage on the fees of the two observations associated with the small auditors and the positive effect of HHI on eight observations associated with the largest audit firm. The estimated effect of HHI using these two markets in the sample is most likely positive since the second market has higher HHI and higher average fees than the first market. The following hypothesis summarizes the above discussion. Again we state H3 in the unconditional form, that is, when the within market competition is not controlled separately.

Hypothesis 3: The presence of more small audit firms in a concentrated market has a negative incremental effect on the relation between HHI and audit fees.

3. Research Design

Building on prior audit fee research (Simunic 1980; Francis, Reichelt, Wang 2005; Hay, Knechel, and Wong 2006), we use the following basic empirical model for our tests:

$$LAF = \alpha_0 + \Omega X + \Theta Y + FIXED\_EFFECTS + \varepsilon, \qquad (1)$$

where LAF equals the natural log of audit fees; X is a vector of testing variables and Ω is the vector of corresponding coefficients; Y is a vector of control variables and Θ is the vector of

corresponding coefficients; FIXED_EFFECTS include the effect of year and industry; ε is the random-error term.

To test Hypotheses 1, we look at the impact of HHI on the fees charged by audit firms while controlling the individual audit firms' competitive positions in each market. We first calculate the concentration index as follows:

$$\mathrm{HHI} = \sum_{i=1}^{N} s_i^2,$$

where s_i is the market share of firm i in an MSA-Industry market, and N is the number of firms.

One implicit condition in Hypothesis 1 is that the audit fee model includes the two components of competition in a market: the audit firms' collective market power over the clients (proxied by HHI) and the audit firms' relative competition positions to each other. To test Hypothesis 1, the audit firms' relative competitive positions to each other in a market must be properly measured.

In the literature, there are two measures available for the individual audit firms' relative competitive positions within each market. The first one is developed by NW using the absolute value of size (total fees) difference between the incumbent auditor and its nearest neighbor. They find that audit fees are an increasing function of this measure.

The second measure for the individual audit firms' competitive positions is developed in CSYZ. CSYZ argue that the transaction costs relating to auditor switching vary across audit firms. Based on the competitive pricing theory in DeAngelo (1981), CSYZ propose that the transaction costs determine the relative competitive positions of the audit firms since every audit firm in the market must price its audit services properly such that the clients will have no incentive to switch

to another audit firm. For a given audit firm, its audit fees must not be greater than the lowest audit fees offered to his clients by other audit firms in the market. Since the largest audit firm in the market has the most resources to handle demand shocks, the lowest audit fees offered to the clients of an incumbent audit firm are from the largest audit firm. Furthermore, the smaller is the incumbent audit firm, the easier is for the largest audit firm to absorb the clients of the audit firm. Consequently, the smaller audit firm in the market must price to a point that its clients are not better off to switch to the largest audit firm in the market. In other words, the smaller audit firm will price their services using the largest audit firm as a reference. For fixed audit fees that the largest audit firm charges a given client, the fees that a smaller audit firm will charge is a decreasing function of the size difference between the largest audit firm and the incumbent audit firm.

CSYZ provide evidence that the audit fees are a decreasing function of DIFFERENCE, defined as the size difference between the largest audit firm in the market and the incumbent audit firm. CSYZ also show that the effect of NW measure goes away after DIFFERENCE is included in the fee model, suggesting CSYZ improve the measure of NW for within market competition. The empirical evidence documented in CSYZ confirms that the competition intensity in an audit market is not uniform to all audit firms, rather, it is audit firm specific.

The theoretical arguments and empirical results in CSYZ support that the variable DIFFERENCE is a proper measure for individual audit firms' competitive positions within a market. As a result, in this paper we will use CSYZ's measure to control for individual audit firms' competitive positions within a market.

The measure DIFFERENCE is defined as an incumbent audit firm's relative size to the market leader based on auditors' total fees in an MSA-Industry market:

$$DIFFERENCE_{at} = \frac{\sum_{i \in \text{dominant auditor in MSA-Industry}} AF_{it} - \sum_{i \in \text{auditor } a \text{ in MSA-Industry}} AF_{it}}{\sum_{i \in \text{MSA-Industry}} AF_{it}},$$

where AF_{it} is the audit fees paid by client *i* in fiscal year *t*, $i \in$ dominant auditor in MSA-Industry indicates client *i* is audited by the dominant auditor in the MSA-Industry market, and $i \in$ auditor *a* in MSA-Industry indicates client *i* is audited by auditor *a* in the MSA-Industry market, and $i \in$ MSA-Industry indicates client *i* is audited by an auditor in the MSA-Industry market, and $DIFFERENCE_{at}$ is the value of DIFFERENCE for auditor *a* in fiscal year *t*.

The variable DIFFERENCE is calculated in every period for each audit firm of a client *i* and it captures the competitive disadvantage of an audit firm relative to the largest audit firm in an MSA-Industry market. After including the variable controlling for audit firms' competitive positions within the market, we expect that the coefficient of the HHI is positive. In addition, to identify the boundary of an appropriate audit market, we also run this analysis on MSA audit markets.

To test Hypothesis 2, we examine the differential effect of the HHI on the fees charged by the largest and other audit firms in a market by using two interaction terms. HHI_Leader is the interaction term between HHI and a dummy variable equal to one if the incumbent firm is the largest audit firm in the market and zero otherwise. HHI_Other is the interaction term between HHI and a dummy variable equal to one if the incumbent firm is not the largest in the market and zero otherwise. H2 predicts that the difference of the coefficient of HHI_Leader and the coefficient of HHI_Other is significantly positive because of the within market competition. Alternatively, we also use HHI, and the interaction variable HHI_Leader in the regression model. In this case, the coefficient of HHI is the concentration effect on smaller audit firms (the same as HHI_Other in

the first method). HHI+HHI_Leader is the concentration effect on the leader (the same as HHI_Leader in the first method). The coefficient of HHI_Leader is the incremental effect (the difference between HHI_Leader and HHI_Other in the first regression).

To test Hypothesis 3, we compare the impact of HHI on two segments out of the sample distinguished by correlation between HHI and significant small audit firms. One segment contains the markets with more positive correlation than the other segment. Hypothesis 3 is then confirmed if without controlling the within market competition, we find a negative coefficient on the interaction term of HHI and an indicator variable equal to one if the market has high concentration and significant small audit firms, and zero otherwise. This is because small firms' relative competitive disadvantage has a negative effect on the relation between HHI and audit fees.

To create a group of MAS-Industry markets that has high concentration and significant small audit firms, we first identify markets of high concentration based on whether the values of their HHI are higher than the median HHI among all markets in the same year and industry. Then we use two alternative methods to identify markets with significant small audit firms. First, we categorize an MSA-Industry market as a market with significant small audit firms if the number of observations (i.e., auditees) associated with other audit firms is more than the observations associated with the largest audit firm in the market. Second, we categorize an MSA-Industry market as a market with significant small audit firms if the median value of DIFFERENCE in this market is higher than the median value of DIFFERENCE in the same year and industry markets. The groups of MAS-Industry markets in the sample with high concentration and significant small audit firms are those that satisfy the above conditions. Hypothesis 3 predicts the coefficient of the interaction term is negative.

The control variables included in the audit fee model are based on numerous previous studies, such as Dao, Raghunandan, and Rama (2012), Francis and Yu (2009), Fung, Gul, and Krishnan (2012), Hanlon, Krishnan, and Mills (2012), Hay et al. (2006), NW, and Simunic (1980). We control for client size (SIZE), complexity (BSEG, GSEG, FOREIGN), and bankruptcy risk (CATA, QUICK, LEV, ROA, LOSS). The coefficients of LTA, LBSEG, LGSEG, FOREIGN, CATA, LEV, and LOSS are expected to be positive. We expect the coefficients of QUICK and ROA to be negative. Following Francis et al. (2005) and Fung et al. (2012), we include audit opinion (OPINION), which is a client-risk measure and may also measure the need for additional work, and a variable indicating a December fiscal year-end (YE), which may also capture a difference in audit costs, hence fees. Extant literature has shown that Big N audit firms earn fee premiums (Hay et al. 2006) and thus we control for Big audit firms (BIG) in the regression. We expect positive coefficients for OPINION, YE, and BIG. Finally, indicators for year, industry effects, and MSA effects (e.g., to control for different cost levels across MSAs) are included in all tests. All variable definitions are presented in Appendix A.

4. Data and Results

Sample and data

We select our sample from two sources: the Audit Analytics database and the Compustat database. Panel A of Table 1 presents the sample-screening procedures. We start with 127,913 observations with audit fee and MSA data for 2000-2016 on Audit Analytics. We merge this data with U.S. MSA file and the data with the Compustat variables. We then exclude companies in the financial sector because the audit fee model for these firms is different from other industries due to their special characteristics (Fields, Fraser, and Wilkins 2004; Kanagaretnam, Krishnan, and

Lobo 2010). Since the audit fees based on the transaction costs in the pricing model describe continuing audit engagements, we exclude observations of first year audit engagement. Furthermore, to focus on the issues of interest in this study, we include audit markets that have more than two active audit firms such that competition exists in each market in the sample. After excluding observations with missing values for any variable, the final sample consists of 27,297 firm-year observations.

Panel B of Table 1 reports descriptive statistics for all variables, and Panel C of Table 1 reports the correlations of the variables. The data presented in these tables are comparable to those reported in previous studies (e.g., Fung et al. 2012). Three ratio variables (QUICK, LEV and ROA) are winsorized at both extreme ends to the one percentile level. Table 1 Panel C presents Spearman correlations for the variables of the empirical model Eq. (1) given above. HHI and DIFFERENCE is correlated with a coefficient of 0.107.

Results

Table 2 presents the results of test on Hypothesis 1. Column (1) presents the results of MSA-Industry markets. The coefficient of HHI is positive and significant (0.144, t-stat=3.35).[2] The coefficient of DIFFERENCE is negative and significant (-0.371, t-stat=-12.86). These results are consistent with Hypothesis 1. When the within market competition is properly controlled, a higher level of concentration is associated with higher audit fees in the market. Therefore, the results support our argument that the state of competition in an MSA-Industry market is determined by two elements. On one hand, when a market has high concentration, it allows audit firms in the market to charge higher audit fees. On the other hand, the relative competition

[2] The coefficient of HHI in Table 8 of Chu et al. (2018) is insignificant. This is because DISTANCE is included in the regression, which introduces confounding effects.

positions of audit firms within the market also affect the audit fees charged by individual audit firms such that every audit firm can remain in the market by retaining its existing clients.

Because the boundary of audit markets is still controversial, we then run the analysis on MSA audit markets (i.e. ignoring client industry) and present the results in Column (2). MSA_HHI is HHI calculated within MSA markets and MSA_DIFFERENCE is DIFFERENCE calculated within MSA markets. The coefficient of MSA_HHI is insignificant. The coefficient of MSA_DIFFERENCE remains significantly negative. To test whether competition occurs within an MSA-Industry market or an MSA market, we add HHI and DIFFERENCE defined using both market definitions in the regression. Column (3) shows that only HHI and DIFFERENCE have significantly predicted signs. Therefore, we conclude that MSA Industry is a better definition of audit markets than MSA alone and, in the rest of analysis, we focus on MSA_Industry markets. Consistent with the existing literature, most of the control variables have significant coefficients with the predicted signs. Specifically, larger, more complex, and riskier firms paid higher audit fees, and more profitable firms paid lower audit fees. Firms audited by Big 4 auditors and firms with December fiscal year end also paid higher fees.

Table 3 presents the test for Hypothesis 2. Column (1) presents the results of the test on the differential effect of HHI on audit fees charged by large and small audit firms if the within audit market competition is not controlled for. HHI_Leader is the interaction term between HHI and the largest audit firm in the market and HHI_Other is the interaction term between HHI and all other audit firms in the market. The coefficient of HHI_Leader is 0.074 (t stat = 1.79), and the coefficient of HHI_Other is -0.242 (t stat = -5.69). The two coefficients have opposite signs. Most importantly, the difference between the coefficients of HHI_Leader and HHI_Other is positive (0.316) and significant ($F = 125.31$ and $p<0.001$). Column (2) presents the results of regressing HHI, Leader,

and HHI_Leader. Consistent with our predictions, we find that the coefficient on HHI_Leader is significantly positive. That is, the largest firm in a market can charge more than other firms when the market becomes more concentrated. The coefficient of HHI is significantly negative because it is the effect of market concentration on small firms' audit fees when the relative competitive position is not controlled. Column (3) controls DIFFERENCE (i.e., relative competitive position to the largest audit firm). The coefficient of HHI becomes significantly positive. The interaction term becomes insignificant because the relative competitive disadvantage effect is captured by DIFFERENCE. For completeness, Column (4) presents the results of HHI_Leader and HHI_Other after controlling DIFFERENCE without including HHI. Both interaction terms become significantly positive. This is consistent with our conjecture that the effects of HHI on Leader and other firms are positive if within market competition is properly controlled.

As we have argued, without controlling for competition within each audit market, the effects of the competitive position of each firm will be obscured by variables correlated with it. When a market is divided into two groups: the leader and other audit firms, then HHI_Leader would capture the effect of HHI on the leader's pricing power and HHI_Other would capture the effect of HHI on the other audit firms' pricing power. Since the leader's pricing power is greater than the other audit firms', the difference is positive. Note that the division of audit firms is not necessarily into two groups and does not necessarily single the leader out because the audit firms' competitive positions are a continuous function of their respective sizes. For example, we also use the first two largest audit firms as the representative of the large firms and other firms as the representative of the small firms. Using HHI_Large as the interaction term between HHI and the two largest audit firms in the market and HHI_Not_large as the interaction term between HHI and all other audit firms in the market, the coefficient of HHI_Large is 0.010 (t stat = 0.24), and the

coefficient of HHI_Not_Large is -0.329 (t stat = -6.61). The two coefficients have opposite signs. The difference between the coefficients of HHI_Large and HHI_Not_Large is positive (0.339) and significant (F = 109.73 and p<0.001).[3] These results support Hypothesis 2 and suggest that HHI captures the differential competitive positions of audit firms when the relative competitive positions are not properly controlled.

Table 4 presents the results of testing H3. If the within market competition is not properly controlled, Hypothesis 3 predicts that markets with high HHI and significant number of small audit firms would have an incremental negative average effect of HHI on audit fees over the other markets in the sample.

HHI_HS is the value of HHI for the MSA-Industry markets whose HHI is higher than the median value of HHI and the number of observations associated with smaller audit firms is larger than the number of observations associated with the largest firm, and HHI_HS equals zero for other markets. Hypothesis 3 predicts that the coefficient of HHI_HS is negative if the within market competition is not properly controlled.

Column (1) presents the results when the variable DIFFERENCE is not included. From the column, HHI is not significant (t-stat=0.93) but HHI_HS is negative and significant (-0.105, t-stat=-3.56). This result supports Hypothesis 3 and is consistent with our argument that, if the within market competition is not controlled for, the estimated effect of HHI is confounded by the correlation between HHI and the significance of small audit firms. More specifically, the coefficient of HHI represents the average effect of HHI on the fees charged by all firms, which is insignificant. By contrast, the coefficient of HHI_HS represents the incremental average effect of HHI on the fees charged by firms in the segments with more positive correlation between HHI and

[3] The results are not tabulated.

significance of small audit firms over the other segment of the sample. The negative coefficient of HHI_HS suggests impact of HHI on fees in markets with high HHI and significant small firms is lower than that on the fees in the other segment of the markets in the sample. Column (2) is the regression results when the within market competition is controlled for (i.e., variable DIFFERENCE is included). Consistent with Table 2, once within market competition is controlled for, the coefficient of HHI becomes positive and significant (0.147, t-stat=3.30) while the variable HHI_HS is not significant anymore (t-stat=-0.26), suggesting that DIFFERENCE has properly controlled for within market competition and there is nothing left for HHI_HS to be associated with. In this case, the audit firms' collective market power is captured by the variable HHI.

Table 5 presents the results with an alternative identification of markets that have high HHI and significant small firms. HHI_HD is the value of HHI for the MSA-Industry markets whose HHI is higher than the median value of HHI and the median value of DIFFERENCE is higher than the median of all markets in the same year and industry.

Column (1) presents the results when the variable DIFFERENCE is not included. From the column, HHI is not significant (t-stat=0.67) but HHI_HD is negative and significant (-0.060, t-stat=-2.20). The results also confirm Hypothesis 3 and are consistent with our arguments that, if the within market competition is not controlled for, HHI loads the average effect on the fees charged by all firms. The impact of HHI on fees is negative in markets with high HHI and significant number of small firms. Column (2) is the regression results when the within market competition is controlled for (i.e., variable DIFFERENCE is included). Consistent with Table 2, once within market competition is controlled for, the coefficient of HHI becomes positive and significant (0.119, t-stat=2.58) while the variable HHI_HD is not significant anymore (t-stat=1.31).

We also use the intersection of the markets with high HHI and significant small audit firms identified in the two alternatives (as in Table 4 and Table 5) as the contrasting segment to test Hypothesis 3 and obtain similar results as in Tables 4 and 5.

In summary, these results support our argument that, without controlling for the within market competition among audit firms, the estimated relationship between market concentration and audit fees is the net of a positive impact of market concentration and a negative impact of smaller firms' competitive position relative to the largest firm within a market. These results confirm our proposition that competition in an audit market is determined by the audit firms' collective market power and individual audit firm's relative position.

Additional analyses

Using the sample of only Big 4 audit firms

Because the coefficient of variable BIG is significantly positive, it is possible that the Big 4 auditors and the Non-Big 4 auditors have differential mechanism for setting audit fees. As a result, mixing both auditor types in the sample may reduce the accuracy of the estimations. To see whether this is the case, we re-run the tests presented in Tables 2-5 using Big 4 audit firms only. The qualitative nature of the results remains unaffected.

The Impact of HHI on the within market competition

CSYZ suggests that DIFFERENCE captures the differential efficiency of audit firms in a market and it is monotonically related to the transaction costs associated with auditor switching. Since DIFFERENCE is calculated using a percentage, rather than the actual size difference, it is possible that the relationships between transaction costs and DIFFERENCE among markets are not the same across markets. That is, the effects of DIFFERENCE on audit fees may differ across

markets. We run a regression by including an interactive term between HHI and DIFFERENCE to see whether the individual audit firms' relative competition positions are affected by the concentration of the market.

Column (1) of Table 6 presents the regression results. The coefficients of HHI and DIFFERENCE are similar as in Table 2. The coefficient of the interaction term between HHI and DIFFERENCE (HHI_DIFFERENCE) is negative and significant (-0.320, t-stat=-2.58). This result suggests that the small audit firms receive greater pressure from the largest firms in the markets with higher concentration. One possible explanation is that the relative transaction costs are more associated with the DIFFERENCE with higher HHI.

Further investigation suggests that HHI is negatively associated with the size of audit market. That is, small audit markets are more concentrated than large audit market. From that link, it seems that the relative transaction costs are more associated with the DIFFERENCE when the market is smaller. To investigate such a possibility, we add an interaction variable between DIFFERENCE and the market size into the audit fee model. Column (2) of Table 6 presents the regression results. The interaction variable MS_DIFFERENCE is the product of variable DIFFERENCE and the natural logarithm of the total fees in the MSA-Industry market. The coefficient of MS_DIFFERENCE is positive and significant (0.203, t-stat=13.87). Confirming that the relative competitive position is affected by both the DIFFERENCE and the market size. Note that the variable HHI_DIFFERENCE is not significant anymore.

This result is quite intuitive. The scale of economy affects the transaction costs of an auditor change. DIFFERENCE only captures the relative difference (market share difference) but not the absolute difference (economy of scale). Therefore, considering the scale of economy may improve the measure of transaction costs and the related competitive positions. As an illustration, we

assume there are two markets that have different sizes. Market A has a total audit fee of $100 million and Market B has a total of audit fees of $10 million. Assume that the respective largest audit firm in each market has a total fee of $30 million and $3 million. We also assume respective incumbent audit firm in each market has a total fee of $10 million and $1 million.

The value of the DIFFERENCE for the incumbent audit firm in each market is the same: 0.2, which is the difference between the largest audit firm's fee share in the market (30%) minus the second audit firm's fee share (10%). However, in Market A, both the largest and the second audit firm are quite large ($30 and $10 million) and have reasonable economic scale. If the transaction costs are a decreasing function of the audit firm size with a decreasing marginal effect, then the relative transaction costs between the largest and the incumbent audit firms in the two markets do not have the same mapping as the value of DIFFERENCE. In other words, difference in the relative transaction costs between the two firms are smaller in Market A than Market B. Thus, the relative transaction costs are more associated with the DIFFERENCE when the market is smaller and the significantly positive coefficient of MS_DIFFERENCE supports our argument.

5. Conclusions

This paper examines competition in MSA-Industry markets by considering both the audit firms' collective market power over clients and individual audit firms' relative competitive positions with respect to each other. We show that the audit fee model needs to incorporate these two measures of competition so that the empirically estimated effects can be logically interpreted. We document that market concentration increases audit firms' collective market power and enables them to charge higher fees. More specifically, we find that the estimated effect of market concentration is confounded by the within market competition if audit firms' relative competitive

positions are not separately controlled for. Since market concentration is positively associated with large audit firm's competitive power and negatively associated with small audit firms' competitive positions, the estimated effect of HHI is negative if in the sample more concentrated markets are associated with significant number of small audit firms. Our results show that the estimated effect of market concentration is positive once within market competition is properly controlled for.

This study makes several important contributions to the audit pricing literature. First, it provides a more complete measure of competition in an audit market. Recent development in the literature suggests that the audit competition in a market is audit firm specific. CSYZ argues that audit firms in a market face differential competitive pressures due to distinctive transaction costs. They argue the transaction costs are a function of audit firms' operational scale and develop a measure for the audit firms' relative competitive positions in a market using the audit firms' relative size in the market. CSYZ use the market fixed effect to control for the largest market power and do not measure how the largest audit firm determines its fees in a market. We include the market concentration index to capture the audit firms' market power and the audit fees charged by the largest auditor.

Second, we provide an explanation for the often-documented negative effect of concentration on audit fees. In the extant literature, researchers find that the concentration (HHI) is often negatively associated with audit fees. We argue that concentration is not a complete measure for audit market competition because it cannot distinguish the within market competition. We find that the market concentration is highly correlated with the distribution of the relative competitive positions of smaller auditors. When the competitive positions within a market are not controlled for, the market concentration reflects both the large audit firm's competitive advantage and small firms' competitive disadvantage. The effects on these two types of audit firms are not

the same and the difference of the effects are significant. In sum, consistent with our theoretical argument, we find the market concentration indeed increases audit fees holding within market competition constant. Lastly, but no least, we propose that an audit fee model should include determinants for both audit firms' collective market power and the audit firms' differential competitive positions within the market.

REFERENCES

Bandyopadhyay, S., Kao, J. (2004). Market structure and audit fees: a local analysis. *Contemporary Accounting Research* 21 (3), 529–561.

Chu, L, Simunic, D. A, Ye, M., Zhang, P. (2018). Transaction costs and competition among audit firms in local markets. *Journal of Accounting and Economics* 65 (1), 129-147.

Chu, L., Zhang, P. (2015). Auditor competition and market formation. Working paper, Wilfred Laurier University, University of Toronto.

Dao, M., Raghunandan, K., Rama, D. V. (2012). Shareholder voting on auditor selection, audit fees, and audit quality. *The Accounting Review* 87 (1), 149–171.

DeAngelo, L. (1981). Auditor independence, 'low balling', and disclosure regulation. *Journal of Accounting and Economics* 3 (2), 113-127.

DeFond, M., Zhang, J. (2014). A review of archival auditing research. *Journal of Accounting and Economics* 58 (2-3), 275-326.

Dopuch, N., Simunic, D.A. (1980). The nature of competition in the auditing profession: A descriptive and normative view. *Regulation and the Accounting Profession*, edited by J.W. Buckley and J.F. Weston, Wadsworth, Inc., Belmont, California, 77-94.

Eshleman, J. D., Lawson, B. P. (2017). Audit market structure and audit pricing. *Accounting Horizon* 31 (1), 57-81.

Feldman, E. R. (2006). A basic quantification of the competitive implications of the demise of Arthur Andersen. *Review of Industrial Organization* 29 (3), 193–212.

Ferguson, C., Pinnuck, M., Skinner, D. J. (2014). The evolution of audit market structure and emergence of the Big 4: Evidence from Australia. *Working paper.* University of Chicago.

Fields, L. P., Fraser, D. R., Wilkins, M. S. (2004). An investigation of the pricing of audit services for financial institutions. *Journal of Accounting and Public Policy* 23 (1), 53-77.

Francis, J. R., Reichelt, K., Wang, D. (2005). The pricing of national and city-specific reputations for industry expertise in the U.S. audit market. *The Accounting Review* 80 (1), 113–36.

Francis, J. R., Yu, M. D. (2009). Big 4 office size and audit quality. *The Accounting Review* 84 (5), 1521–1552.

Fung, S. Y. K., Gul, F. A., Krishnan, J. (2012). City-level auditor industry specialization, economies of scale, and audit pricing. *The Accounting Review* 87 (4), 1281-1307.

Government Accountability Office (GAO). (2008). *Audits of Public Companies: Continued Concentration in Audit Markets for Large Public Companies Does Not Call for Immediate Action*. Washington, DC: GAO.

Hanlon, M., Krishnan, G., Mills, L. F. (2012). Audit fees and book-tax differences. *Journal of the American Taxation Association* 34 (1), 55-86.

Hay, D. C., Knechel, W. R., Wong, N. (2006). Audit fees: A meta-analysis of the effect of supply and demand attributes. *Contemporary Accounting Research* 23 (1), 141–91.

Kanagaretnam, K., Krishnan, G. V., Lobo, G. J. (2010). An empirical analysis of auditor independence in the banking industry. *The Accounting Review* 85 (6), 2011-2046.

Numan, W., Willekens, M. (2012). An empirical test of spatial competition in the audit market. *Journal of Accounting and Economics* 53 (1-2), 450-465.

Pearson, T., Trompeter, G. (1994). Competition in the market for audit services: The effect of supplier concentration on audit fees. *Contemporary Accounting Research* 11 (1), 115-135.

Simunic, D. A. (1980). The pricing of audit services: Theory and evidence. *Journal of Accounting Research* 18 (1), 161–190.

Weiss, L., ed. (1989). *Concentration and Price*. Cambridge, MA: The MIT Press.

Willekens, M., Achmadi, C. (2003). Pricing and supplier concentration in the private client segment of the audit market: market power or competition? *The International Journal of Accounting* 38 (4): 431-455.

Appendix A: Variable Definitions

Dependant variable		
LAF	=	natural log of audit fees of client i
Variables of interest		
DIFFERENCE	=	(The difference of the total audit fees in an MSA-Industry market between the largest audit firm in the market and the incumbent auditor of client i) ÷ Total audit fees in the MSA-Industry market. An MSA-Industry market is defined as a two-digit SIC industry in a U.S. Metropolitan Statistical Area (MSA, U.S. Census Bureau definition)
HHI	=	Herfindahl concentration index per MSA-Industry audit market, where the Herfindahl index is calculated as the sum of s_i^2, where i is an audit office in an MSA-Industry market and s is market share in the market based on audit fees
HHI_Leader	=	Interaction of HHI and a dummy variable equal to one if the incumbent firm is the largest firm in the MSA-Industry market and zero otherwise
HHI_Other	=	Interaction of HHI and a dummy variable equal to one if the incumbent firm is not the largest in the MSA-Industry market and zero otherwise
HHI_DIFFERENCE	=	Interaction of variables HHI and DIFFERENCE
HHI_HS	=	HHI if the HHI in a MSA-Industry market is higher than the median among all MSA-industry markets of the same year and industry and the number of observations associated with all audit firms except the largest audit firm is greater than the number of observations associated with the largest audit firm, and zero otherwise
HHI_HD	=	HHI if the HHI in a MSA-Industry market is higher than the median among all MSA-industry markets of the same year and industry and the median DIFFERENCE in the MSA-Industry market is higher than the median DIFFERENVCE of all MSA-industry markets of the same year and industry, and zero otherwise
MS_DIFFERENCE	=	Interaction of variables DIFFERENCE and the MSA-Industry size that equal the natural logarithm of the total fees in the market
MSA_HHI	=	HHI calculated within MSA markets
MSA_DIFFERENCE	=	DIFFERENCE calculated within MSA markets
Control variables		
SIZE	=	natural log of total assets
BSEG	=	natural log of the number of unique business segments
GSEG	=	natural log of the number of unique geographic segments
CATA	=	ratio of current assets to total assets
QUICK	=	ratio of current assets excluding inventory to current liabilities
LEV	=	ratio of long-term debt to total assets
ROA	=	ratio of earnings before interest and tax to total assets
FOREIGN	=	an indicator variable that equals one if revenue from foreign operations is reported, and zero otherwise
OPINION	=	an indicator variable that equals one for a going-concern audit report, and zero otherwise

YE	=	an indicator variable that equals one for December 31 year-end, and zero otherwise
LOSS	=	an indicator variable that equals one if there is a loss in current year, and zero otherwise
BIG	=	an indicator variable that equals one for Big N auditors, and zero otherwise
Leader	=	an indicator variable that equals one if the audit firm is the largest in an MSA-Industry market.

Table 1: Description of Data

Panel A: Sample Selection

Observations in USA with audit fee and MSA data for 2000-2016 on Audit Analytics	127,913
After merging with Compustat data	48,035
After excluding financial sector (SIC 6000-6999)	45,502
After excluding first year engagement	42,602
After excluding markets with fewer than three audit firms	28,054
After excluding observations with missing values of variables	27,297

Panel B: Descriptive Statistics (N=27,297)

Variable	Mean	Median	Standard Deviation	P5	P95
HHI	0.427	0.390	0.172	0.223	0.781
DIFFERENCE	0.230	0.146	0.253	0.000	0.724
Leader	0.379	0.000	0.485	0.000	1.000
SIZE	6.041	5.873	2.059	2.924	9.686
BSEG	0.467	0.000	0.637	0.000	1.609
GSEG	0.692	0.693	0.727	0.000	1.946
CATA	0.510	0.515	0.267	0.083	0.937
QUICK	2.874	1.672	3.512	0.506	9.425
LEV	0.456	0.451	0.235	0.097	0.855
ROA	-0.038	0.024	0.201	-0.503	0.169
FOREIGN	0.527	1.000	0.499	0.000	1.000
OPINION	0.028	0.000	0.166	0.000	0.000
YE	0.725	1.000	0.446	0.000	1.000
LOSS	0.389	0.000	0.488	0.000	1.000
BIG	0.782	1.000	0.413	0.000	1.000

Panel C: Spearman Correlation (Bold denoted significant at 5% or lower)

		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	HHI	1.000													
2	DIFFERENCE	**0.107**	1.000												
3	SIZE	**0.051**	**-0.372**	1.000											
4	BSEG	**0.059**	**-0.078**	**0.296**	1.000										
5	GSEG	**-0.077**	**-0.140**	**0.272**	**0.145**	1.000									
6	CATA	**-0.012**	**0.091**	**-0.473**	**-0.191**	**0.105**	1.000								
7	QUICK	**-0.060**	**0.033**	**-0.283**	**-0.188**	**0.046**	**0.560**	1.000							
8	LEV	**0.107**	**-0.105**	**0.366**	**0.182**	**-0.018**	**-0.380**	**-0.686**	1.000						
9	ROA	**0.013**	**-0.063**	**0.329**	**0.156**	**0.168**	**-0.126**	**-0.067**	-0.024	1.000					
10	FOREIGN	**-0.056**	**-0.129**	**0.300**	**0.101**	**0.605**	**0.082**	**0.027**	0.029	**0.157**	1.000				
11	OPINION	**-0.013**	**0.083**	**-0.184**	**-0.061**	**-0.081**	**-0.040**	**-0.117**	0.062	**-0.189**	**-0.071**	1.000			
12	YE	**0.047**	**-0.060**	**0.052**	**-0.016**	**-0.104**	**-0.115**	-0.008	0.071	**-0.089**	**-0.083**	0.002	1.000		
13	LOSS	**-0.043**	**0.078**	**-0.361**	**-0.179**	**-0.124**	**0.182**	**0.135**	-0.057	**-0.846**	**-0.121**	**0.176**	**0.058**	1.000	
14	BIG	**0.060**	**-0.456**	**0.447**	**0.075**	**0.182**	**-0.052**	**0.025**	0.094	**0.069**	**0.158**	**-0.138**	**0.062**	**-0.090**	1.000

Table 2: The Impact of Market Concentration on Audit Pricing with Control for the Relative Competitive Power in MSA-Industry or/and MSA Audit Markets

VARIABLES	LAF (1)	LAF (2)	LAF (3)
HHI	0.144***		0.158***
	(3.35)		(3.61)
DIFFERENCE	-0.371***		-0.367***
	(-12.86)		(-12.25)
MSA_HHI		-0.039	-0.260*
		(-0.28)	(-1.82)
MSA_DIFFERENCE		-0.251***	-0.038
		(-4.05)	(-0.60)
SIZE	0.552***	0.576***	0.552***
	(12.32)	(12.93)	(12.30)
BSEG	0.125***	0.124***	0.125***
	(10.83)	(10.65)	(10.84)
GSEG	0.136***	0.139***	0.137***
	(11.78)	(11.93)	(11.86)
CATA	0.430***	0.444***	0.429***
	(11.18)	(11.46)	(11.17)
QUICK	-0.029***	-0.029***	-0.028***
	(-12.39)	(-12.31)	(-12.36)
LEV	0.244***	0.255***	0.247***
	(7.09)	(7.32)	(7.18)
ROA	-0.278***	-0.293***	-0.279***
	(-8.42)	(-8.82)	(-8.46)
FOREIGN	0.245***	0.244***	0.246***
	(15.67)	(15.47)	(15.76)
OPINION	0.041	0.039	0.040
	(1.23)	(1.18)	(1.20)
YE	0.096***	0.100***	0.095***
	(5.85)	(6.01)	(5.77)
LOSS	0.069***	0.069***	0.068***
	(5.32)	(5.26)	(5.24)
BIG	0.319***	0.347***	0.315***
	(15.16)	(13.67)	(12.53)
Constant	8.212***	7.981***	8.262***
	(15.86)	(15.36)	(15.94)
Observations	27,297	27,297	27,297
Adjusted R-squared	0.843	0.840	0.843

This table presents regression results of the audit fee model with the control of within market competition. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively, using two-tailed tests. t-statistics in parentheses is determined by clustered standard errors at firm level.

Table 3: The Impact of Market Concentration on Audit Pricing of Different Sized Audit Firms in MSA-Industry Audit Markets

VARIABLES	LAF (1)	LAF (2)	LAF (3)	LAF (4)
HHI		-0.233***	0.233***	
		(-5.49)	(3.36)	
Leader		0.045***	0.043**	
		(2.66)	(3.36)	
HHI_Leader	0.074*	0.306***	-0.083	0.150***
	(1.79)	(10.83)	(-1.63)	(3.55)
HHI_Other	-0.242***			0.233***
	(-5.69)			(3.36)
DIFFERENCE			-0.436***	-0.436***
			(-8.19)	(-8.19)
SIZE	0.559***	0.563***	0.556***	0.556***
	(12.24)	(12.39)	(12.52)	(12.52)
BSEG	0.125***	0.125***	0.124***	0.124***
	(10.84)	(10.80)	(10.79)	(10.79)
GSEG	0.138***	0.136***	0.134***	0.134***
	(11.92)	(11.79)	(11.63)	(11.63)
CATA	0.437***	0.437***	0.429***	0.429***
	(11.35)	(11.35)	(11.17)	(11.17)
QUICK	-0.029***	-0.029***	-0.028***	-0.028***
	(-12.47)	(-12.46)	(-12.36)	(-12.36)
LEV	0.246***	0.249***	0.247***	0.247***
	(7.13)	(7.24)	(7.19)	(7.19)
ROA	-0.285***	-0.286***	-0.278***	-0.278***
	(-8.62)	(-8.67)	(-8.44)	(-8.44)
FOREIGN	0.244***	0.245***	0.245***	0.245***
	(15.61)	(15.63)	(15.68)	(15.68)
OPINION	0.039	0.038	0.040	0.040
	(1.17)	(1.15)	(1.22)	(1.22)
YE	0.098***	0.098***	0.096***	0.096***
	(5.94)	(5.92)	(5.83)	(5.83)
LOSS	0.069***	0.070***	0.070***	0.070***
	(5.32)	(5.35)	(5.36)	(5.36)
BIG	0.360***	0.350***	0.305***	0.305***
	(17.60)	(16.78)	(13.99)	(13.99)
Constant	8.130***	8.084***	8.169***	8.169***
	(15.45)	(15.42)	(15.90)	(15.90)
Observations	27,297	27,297	27,297	27,297
Adjusted R-squared	0.842	0.842	0.843	0.843

This table presents the regression results on the impact of market concentration on audit pricing of different sized audit firms using an audit fee model. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively, using two-tailed tests. t-statistics in parentheses is determined by clustered standard errors at firm level.

Table 4: The Impact of Market Concentration on Audit Pricing in Markets with High Concentration and Significant Number of Small Audit Firms in MSA-Industry Audit Markets

VARIABLES	(1) LAF	(2) LAF
HHI	0.041	0.147***
	(0.93)	(3.30)
HHI_HS	-0.105***	-0.008
	(-3.56)	(-0.26)
DIFFERENCE		-0.370***
		(-12.53)
SIZE	0.579***	0.553***
	(13.02)	(12.32)
BSEG	0.125***	0.125***
	(10.78)	(10.84)
GSEG	0.137***	0.136***
	(11.82)	(11.77)
CATA	0.443***	0.429***
	(11.47)	(11.19)
QUICK	-0.029***	-0.029***
	(-12.23)	(-12.39)
LEV	0.251***	0.244***
	(7.24)	(7.09)
ROA	-0.289***	-0.278***
	(-8.70)	(-8.41)
FOREIGN	0.244***	0.245***
	(15.42)	(15.67)
OPINION	0.039	0.041
	(1.18)	(1.23)
YE	0.103***	0.096***
	(6.22)	(5.85)
LOSS	0.071***	0.069***
	(5.43)	(5.32)
BIG	0.399***	0.319***
	(19.55)	(15.16)
Constant	7.848***	8.208***
	(15.12)	(15.84)
Observations	27,297	27,297
Adjusted R-squared	0.840	0.843

This table presents results from two regressions examine the impact of HHI in high concentration markets that also have significant number of small audit firms. Column (1) reports the results when variable DIFFERENCE is not included and Column (2) reports the results when DIFFERENCE is included. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively, using two-tailed tests. t-statistics in parentheses is determined by clustered standard errors at firm level.

Table 5: The Impact of Market Concentration on Audit Pricing in Markets with High Concentration and Large Value of DIFFERENCE in MSA-Industry Audit Markets

VARIABLES	(1) LAF	(2) LAF
HHI	0.030	0.119***
	(0.67)	(2.58)
HHI_HD	-0.060**	0.035
	(-2.20)	(1.31)
DIFFERENCE		-0.378***
		(-12.81)
SIZE	0.578***	0.552***
	(12.95)	(12.31)
BSEG	0.124***	0.124***
	(10.71)	(10.78)
GSEG	0.138***	0.136***
	(11.86)	(11.81)
CATA	0.445***	0.431***
	(11.48)	(11.22)
QUICK	-0.029***	-0.029***
	(-12.21)	(-12.38)
LEV	0.252***	0.243***
	(7.25)	(7.08)
ROA	-0.291***	-0.279***
	(-8.74)	(-8.46)
FOREIGN	0.244***	0.244***
	(15.42)	(15.64)
OPINION	0.040	0.040
	(1.19)	(1.24)
YE	0.103***	0.096***
	(6.19)	(5.81)
LOSS	0.071***	0.069***
	(5.43)	(5.33)
BIG	0.400***	0.319***
	(19.57)	(15.14)
Constant	7.862***	8.235***
	(15.10)	(15.90)
Observations	27,297	27,297
Adjusted R-squared	0.840	0.843

This table presents results from two regressions examine the impact of HHI in high concentration markets that also have significant number of small audit firms. Column (1) reports the results when variable DIFFERENCE is not included and Column (2) reports the results when DIFFERENCE is included. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively, using two-tailed tests. t-statistics in parentheses is determined by clustered standard errors at firm level.

Table 6: The Impact of Concentration on the Individual Audit Firms' Relative Competitive Positions in MSA-Industry Audit Markets

VARIABLES	(1) LAF	(2) LAF
HHI	0.211***	0.215***
	(4.10)	(4.19)
DIFFERENCE	-0.187**	-3.695***
	(-2.51)	(-14.30)
HHI_DIFFERENCE	-0.320***	-0.070
	(-2.58)	(-0.56)
MS_DIFFERENCE		0.203***
		(13.87)
SIZE	0.548***	0.564***
	(12.20)	(12.85)
BSEG	0.125***	0.129***
	(10.87)	(11.31)
GSEG	0.137***	0.135***
	(11.84)	(11.94)
CATA	0.431***	0.412***
	(11.25)	(10.96)
QUICK	-0.029***	-0.028***
	(-12.47)	(-12.46)
LEV	0.241***	0.251***
	(7.01)	(7.38)
ROA	-0.276***	-0.247***
	(-8.37)	(-7.51)
FOREIGN	0.245***	0.239***
	(15.70)	(15.57)
OPINION	0.040	0.040
	(1.25)	(1.17)
YE	0.097***	0.092***
	(5.87)	(5.73)
LOSS	0.070***	0.068***
	(5.37)	(5.30)
BIG	0.327***	0.329***
	(15.43)	(16.01)
Constant	8.214***	8.179***
	(15.88)	(16.24)
Observations	27,297	27,297
Adjusted R-squared	0.843	0.846

This table presents results from two regressions examine the impact of HHI and MAS-Industry size on the individual audit firms' relative competition positions. Column (1) reports the results when variable HHI_DIFFERENCE is included and Column (2) reports the results when both HHI_DIFFERENCE and MS_DIFFERENCE are included. *, **, and *** represent significance at the 10%, 5%, and 1% levels, respectively, using two-tailed tests. t-statistics in parentheses is determined by clustered standard errors at firm level.